

952.077

PATENT SPECIFICATION

DRAWINGS ATTACHED

952.077



Date of Application and filing Complete Specification: Aug. 19, 1960.
No. 28883/60.

Complete Specification Published: March 11, 1964

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Index at acceptance:—A2 C(1A1, 1C1, 1C2)

International Classification:—A 24 c

COMPLETE SPECIFICATION

Cigarette-Making Machine

I, IAN MELVILLE CLARK, M.A., a Fellow of the Chartered Institute of Patent Agents, of A. M. & WM. CLARK, of 5 Stone Buildings, Lincoln's Inn, London, W.C.2, a British Subject, do hereby declare the invention (a communication from GÖFFREDO GAMBERINI, an Italian citizen, of 9 Via Mazzini, Bologna, Italy), for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method and apparatus for forming a uniform rope of made on what is known as continuous rod form from which cigarettes are severed from the leading end of the rod.

Most cigarettes on the market today are made on what is known as continuous rod machines. These machines shower tobacco fed from a hopper on to a tape. This tape conveys the stream of tobacco so collected through the rod-forming mechanism of a cigarette-making machine. This stream or rope of tobacco is formed into a rod by folding the paper around the tobacco as it passes through the rod-forming mechanism.

One of the disadvantages of conventional cigarette-making machines is that the uniformity of the tobacco in the rod is not as great or as consistent as is desired by the cigarette manufacturer or by the public. Cigarettes formed on such machines have varying degrees of light and heavy density and such variations can be noticed from cigarette to cigarette and sometimes in the individual cigarette itself. To overcome this deficiency of conventional cigarette-making machines, it is sometimes the practice of manufacturers to overfeed tobacco into the rod so that the less dense portions will not be so noticeable, but this is objectionable because not only is it a waste of tobacco, but the smoking qualities of the cigarette are lessened in that the cigarettes do not draw as well. If on the other hand cigarettes are made less dense, then the hollow spots appear more noticeable and where a hollow spot appears at the end of the cigarette

[Price 4s. 6d.]

the tobacco can more readily fall out of the cigarette.

It is an object of this invention to provide an improved method and apparatus for manufacturing cigarettes having uniform weight of tobacco per incremental or unit length.

According to the invention there is provided a method of forming a uniform rope of tobacco for wrapping to form a continuous cigarette rod, including the steps of showering strands of tobacco upon a rotating suction drum having a permeable peripheral face so as to collect a tobacco stream thereon, said face having a groove therein with a cross-sectional area substantially equal to the desired cross-sectional area of an uncompressed stream of tobacco prior to passing it to a cigarette rod former, and transferring the deposited tobacco strands from the drum face on to a conveyor which is moving substantially tangentially to the suction drum so that the relative arrangement of the strands of tobacco as deposited on the drum face is not disturbed when transferred to said conveyor.

According to the invention there is also provided apparatus for forming a uniform rope of tobacco for wrapping to form a continuous cigarette rod, including means for showering strands of tobacco upon a rotatable suction drum having a permeable peripheral face so as to collect a tobacco stream thereon, said face having a groove therein with a cross-sectional area substantially equal to the desired cross-sectional area of an uncompressed stream of tobacco prior to passing it to a cigarette rod former, and means for transferring the deposited tobacco strands from the drum face on to a conveyor which is movable substantially tangentially to the suction drum so that the relative arrangement of the strands of tobacco as deposited on the drum face is not disturbed when transferred to said conveyor.

Other objects and features of the invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying

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drawings, which form a part of this specification, like characters of reference have been applied to corresponding parts throughout the several view which make up the drawings.

5 Figure 1 is a schematic view in vertical section of the feed group of a continuous cigarette-making machine, made according to the invention.

10 Figure 2 is a partial front elevation view of the cigarette-making machine with some parts of the feed group omitted for simplicity of representation.

Figure 3 illustrates on a larger scale a detail of Figure 2.

15 Figure 4 is a section along line IV—IV of Figure 3.

Figure 5 illustrates in partial front elevation a modified form of the invention.

20 In Figures 1 and 2, there is shown a feed box or hopper 1 of a continuous rod cigarette-making machine. The tobacco deposited in this hopper 1 is withdrawn by means of a carded drum 2, against which it is pushed by a conveyor carpet 3 travelling at the bottom of box 1 in the direction indicated by the arrow. The layer of tobacco engaged with the pin facing of the carding drum 2 is rendered uniform by a fixed smoothing sector 4. A rotating rake 5 pushes any excess tobacco away from drum 2. The upper carded refuser cylinder 6 cooperates with said drum 2 to trim off any tobacco extending above the carding on drum 2. The shield 7 is provided to avoid any undesirable air turbulence. The tobacco picked up by the carding drum 2 is removed by means of a spiked picker roll 8 (Figure 1), and is discharged on to the lower shield 9 and front shield 10, in a continuous flow between the two rotating cylinders 11 and 12.

40 Under the cylinders 11 and 12 and parallel thereto there is disposed a rotating cylinder 13, a so-called selector, made of suitable material permeable to air as for example of porous sintered metal, or one or more layers of fine wire gauze, or the like. This selector drum 13 is connected, for example through a coaxial duct 113 in its shaft, to the suction side of an air pump so as to produce in said drum 13 a vacuum which manifests itself in a peripheral sucking action of the drum. Inside drum 13 is arranged any desired vacuum-distributing device, laid out with a fixed shutter sector 14 coaxial to drum 13 and fitting against its inner wall. This vacuum-distributing device, or said fixed shutter sector 14, limits the peripheral sucking action of drum 13 to a fraction of its angle of rotation.

60 The tobacco which passes between the two cylinders 11 and 12 is directed toward the rotating selector drum 13 at its suction sector. The showered tobacco is directed toward the drum 13 by an opposite deflector 15 which is substantially tangential to the selector drum and is adjustable to various distances therefrom, through its fulcrumed mounting 115.

In this way, all or nearly all the lighter parts of the tobacco shower remain attracted by suction on the selector drum 13, together with those heavier tobacco parts which come directly into contact with drum 13 or which pass very close to it. That fraction of the heavier tobacco parts which are retained by suction on the selector drum 13 can be varied at will, by adjusting the deflector 15 to different distances from drum 13, so as to condense the tobacco shower more or less on drum 13, or to make it pass more or less close to the latter, that is, so as to cause a greater or smaller fraction of the heavy parts of tobacco to be directed into contact with said suction drum 13 or to pass very close to it.

The other heavy parts of the tobacco which are not attracted by the selector drum 13 because they are too heavy or because they pass too far from it through a field of insufficient suction force fall on an underlying conveyor carpet 16 which may either discharge them into a collecting bin 17 or return them to the feed hopper 1.

In this way there is retained on the rotating selector drum 13 by suction a uniform layer of tobacco which comprises light and heavy parts, in the proportion desired for the type of cigarettes to be made, and which corresponds to the adjustment of the deflector 15. This layer of tobacco is discharged from the selector drum 13 by gravity and centrifugal force at the end of its suction sector and falls, passing over a rotating cylinder 19 and through a hopper 20, 21, in a uniform layer onto a collecting conveyor belt 18 which is substantially horizontal and extends on the front of the cigarette-making machine parallel to the selector drum 13 over the full length thereof.

The selector drum 13 is cleaned from any particles of tobacco by an external suction mouth 22 provided at the non-suction sector of said drum 13, that is, at the fixed internal shutter sector 14.

The rod forming mechanism designated generally by the reference character 23 may be of a conventional design, and consists generally of the following: A rod forming tape 24 travelling in the direction indicated by the arrow supports on its upper surface a paper web 25 which travels along with the tape 24. The paper web 25 is continuously drawn off from a reel 125 in a manner well-known in the art. The tobacco discharged from the suction drum 29 is deposited on top of the paper tape 25 and from there the tobacco passes suitable compressing means which reduce the tobacco stream to the shape of a rope. The rope web and paper then pass through suitable guides which turn the paper and web upwardly and around the rope so as to form a rod with the lap edge of the paper extending upwardly.

Paste is applied to the upwardly extending

paper web after which it passes the next forming process wherein the lap edge is pressed down over the other edge of the paper and from there it passes under an ironer which dries the pasted seam.

5 Thereafter, the rod passes through a suitable cut-off which severs desired lengths of rod from the leading end and a suitable collecting mechanism receives and accumulates the severed lengths side by side.

10 This general description is, of course, brief and it will be appreciated many mechanisms have been devised for forming a stream of tobacco into a rod which may very readily be used for forming any tobacco stream into a rod. These devices have been generally designated by the reference characters 26, 27 and 28 and may be of the type described in British Patent Specification 707,239.

20 In the embodiment of the invention shown in Figure 1, the collecting belt 18 runs in an opposite direction to the belt 24 of the underlying rod-forming mechanism 23 and hence in opposite direction to the movement of the continuous strip of paper 25. Means are provided which receive the tobacco from the collecting belt 18 and transfer the tobacco, changing the direction of its movement, onto and along the underlying rod-forming mechanism 23, depositing it in the form of a continuous cord or rope on the strip of paper 25.

30 For that purpose, there is disposed at the beginning of the rod-forming mechanism 23, over the conveyor belt 24 thereof and between said belt and the terminal end of the upper collecting belt 18, a hollow wheel 29 which is driven in opposite direction to the tobacco conveying laps of the two belts 18, 24 and which presents a peripheral groove 129, preferably of a slightly trapezoidal section, and having a cross-sectional area substantially equal to the desired cross-sectional area of an uncompressed stream of tobacco. Two flanges 40 and 41 on wheel 29 form the side walls of peripheral groove or trough 129. The bottom 45 229 of this groove 129 is made of material permeable to air and preferably of porous sintered metal or of one or more layers of fine wire gauze, or the like, and the hollow wheel 29 is connected for example through a coaxial duct 329 in its shaft to the suction side of an air pump. In this way, analogously to what has been described for the selector drum 13, there is imparted to the wheel 29 a peripheral suction power, limited to the bottom of its circumferential external groove 129, and also, for example by means of a fixed internal shutter sector 30 or other equivalent vacuum limiting means, to a fraction of the angle of rotation of wheel 29, extending in the direction of rotation of the latter from the upper collecting belt 18 to the underlying rod forming line 23.

60 The tobacco, deposited by the selector drum 65 13 on the collector belt 18, is caused to fall

from the latter onto wheel 29 at its suction sector, being attracted and retained by suction on that wheel 29 and filling its peripheral groove 129, in which it is lightly compressed by a pressure roll 36 or equivalent means. At the suction sector of wheel 29 is provided a knife 31 substantially tangential to said wheel and turned with its cutting edge against the direction of rotation thereof, in contact or almost so with the edges of its peripheral groove 129 (see Figures 3 and 4). With knife 31 there cooperates a roll 32 provided with radial vanes 132, each formed of many fine blades which pass very close to the cutting edge of knife 31, in the direction of rotation of the suction wheel 29. In this way, the excess tobacco, projecting from groove 129 of the suction wheel 29 is lifted by the scraping knife 31 and cut on the cutting edge thereof by means of the vaned roll 32, 132. This removed part of the tobacco is collected in a hood 33 in which are enclosed the knife 31 and the roll 32 and from which the tobacco is removed by suitable means such as by suction through a mouth 133.

90 The tobacco which remains attached to the suction wheel 29 and which exactly fills the peripheral groove 129 thereof is deposited at the end of the suction sector of said wheel, that is, at the beginning of the rod-forming mechanism 23, in the form of a continuous rope of tobacco on the strip of paper 25. The suction wheel 29 is cleaned from any tobacco particles by an outer suction mouth 34, provided at the non-suction section of said wheel, 29, that is, at its inner shutter sector 30.

100 The above described arrangement and in particular the inverse movements of the tobacco on the upper collecting belt 18 and on the underlying rod-forming mechanism 23 results in a considerable reduction of the total length of the cigarette making machine, as is evident in Figure 2. To the accomplishment of this advantage there contributes also the suction wheel 29 which reverses the movement of the tobacco, transferring it from the collecting belt 18 to the underlying rod-forming apparatus. While this feature is desirable, the principle feature of the invention comprises the conveying suction wheel 29 which has the main task of forming the rope of tobacco by means of its peripheral groove 129, by slightly compressing it in cooperation with the roll 36, and of correcting it by means of the levelling devices 31, 32 so that the rope of tobacco which is deposited on the rod-forming line presents a constant compactness and a uniform section, that is, presents a constant weight per unit of length.

125 For the latter purpose, the tobacco rope forming suction wheel 29 may be used to advantage also in other cigarette-making machines, of a type other than that described above, whether or not in combination with the selector suction drum 13. Such a possibility 130

of application is illustrated by way of non-limitative example in Figure 5 which illustrates a variant of the cigarette-making machine of Figure 2, similar parts being indicated with the same reference numbers as used before.

A modification of the arrangements shown in Figure 2, has been shown in Figure 5 wherein the collecting belt 18 runs in the same direction as the continuous paper strip 25 in the rod-forming line 23. The tobacco is fed in a uniform layer onto the collecting belt 18, by means of any desired device and preferably by means of the selector suction drum 13, and it is transferred without reversing its direction to the rod-forming mechanism 23 by the suction wheel 29 to form the tobacco rod. This wheel 29 is made and operates in the same manner as already described, but rotates in the opposite direction to that in Figure 2. In this case while no substantial shortening of the cigarette-making machine is obtained, a uniform and compact rod of tobacco is nevertheless obtained by means of my improved tobacco feed wheel 29.

The tongue of the rod-forming mechanism 23 may be vibrated relative to the running belt 24, to limit the effect of friction due to the adhesion on the fixed parts which effect the formation of the rod.

The invention hereinabove described may therefore be varied in construction within the scope of the claims, for the particular device selected to illustrate the invention is but one of many possible embodiments of the same. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

WHAT I CLAIM IS:—

1. A method of forming a uniform rope of tobacco for wrapping to form a continuous cigarette rod, including the steps of showering strands of tobacco upon a rotating suction drum having a permeable peripheral face so as to collect a tobacco stream thereon, said face having a groove therein with a cross-sectional area substantially equal to the desired cross-sectional area of an uncompressed stream of tobacco prior to passing it to a cigarette rod former, and transferring the deposited tobacco strands from the drum face on to a conveyor which is moving substantially tangentially to the suction drum so that the relative arrangement of the strands of tobacco as deposited on the drum face is not disturbed when transferred to said conveyor.

2. A method as claimed in Claim 1, including the step of compressing the tobacco stream conveyed on the face of the drum.

3. A method as claimed in claim 1 or claim 2, including the step of trimming excess tobacco from the face of the drum as the tobacco passes a trimming station.

4. A method as claimed in any of claims

1 to 3, including the step of removing the suction from the drum face when it is desired to transfer the tobacco to said conveyor.

5. A method as claimed in any of claims 1 to 4, including the step of placing a paper tape upon said conveyor so that the tobacco is transferred onto the paper tape.

6. A method as claimed in any of claims 3 to 5, including the step of brushing excess tobacco from the face of the drum at said trimming station.

7. A method as claimed in any of claims 1 to 6, including the step of rotating a permeable selector cylinder at right angles to and above said suction drum, passing said strands of tobacco between said permeable selector cylinder and an adjustable deflector plate before it is showered on to said suction drum, establishing a suction within said selector cylinder, and adjusting said deflector so that a portion of the heavy particles in the tobacco stream adhere to said selector cylinder and another portion of the heavy particles is acted upon by gravity and falls away from the selector cylinder.

8. A method as claimed in claim 7, including the step of removing the vacuum from said selector cylinder and conveying the strands of tobacco from said selector cylinder on to a moving conveyor which discharges the strands of tobacco upon said suction drum.

9. A method as claimed in claim 8, wherein a rotating cylinder is spaced from, and turns in the opposite direction from, said selector cylinder, and including the step of passing the stream of tobacco between said cylinders so that the tobacco stream is transferred onto an upper side of said rotating cylinder and thereafter discharged upon said last mentioned conveyor.

10. Apparatus for forming a uniform rope of tobacco for wrapping to form a continuous cigarette rod, including means for showering strands of tobacco upon a rotatable suction drum having a permeable peripheral face so as to collect a tobacco stream thereon, said face having a groove therein with a cross-sectional area substantially equal to the desired cross-sectional area of an uncompressed stream of tobacco prior to passing it to a cigarette rod former, and means for transferring the deposited tobacco strands from the drum face on to a conveyor which is movable substantially tangentially to the suction drum so that the relative arrangement of the strands of tobacco as deposited on the drum face is not disturbed when transferred to said conveyor.

11. Apparatus as claimed in claim 10, including a rotatable member which is arranged to co-operate with the groove in the suction drum face for compressing or compacting the tobacco into said groove.

12. Apparatus as claimed in claim 10 or claim 11, including means for trimming ex-

cess tobacco extending beyond the groove in the suction drum face.

- 5 13. Apparatus as claimed in any of claims 10 to 12, including means for removing the suction from the suction drum face when it is desired to transfer the tobacco from the drum face to said conveyor.

- 10 14. Apparatus as claimed in any of claims 10 to 13, including means for positioning a paper tape upon said conveyor so that the tobacco is transferred from the drum face to the paper tape.

- 15 15. Apparatus as claimed in any of claims 12 to 14, wherein said trimming means includes a rotatable brush.

- 20 16. Apparatus as claimed in any of claims 10 to 15, including a rotatable permeable selector cylinder disposed at right angles to and above said suction drum, means for passing said strands of tobacco between the permeable selector cylinder and an adjustable deflector plate before it is showered on to said suction drum, means for establishing a suction within said selector cylinder, and means for adjusting said deflector so that a portion of the heavy particles in the tobacco stream adhere to said selector cylinder and another portion of the heavy particles is acted upon by gravity and falls away from the selector cylinder.

- 30 17. Apparatus as claimed in claim 16, including means for removing the vacuum

from said selector cylinder and means for conveying the strands of tobacco from said selector cylinder onto a moving conveyor which is arranged to discharge the strands of tobacco on to said suction drum. 35

18. Apparatus as claimed in claim 17, wherein said last mentioned conveyor is disposed above said suction drum and generally in the same plane as said suction drum. 40

19. Apparatus as claimed in claim 17 or claim 18, including a rotatable cylinder spaced from, and rotatable in the direction opposite from said selector cylinder, and means for passing the stream of tobacco between said cylinders so that the tobacco stream is transferred on to an upper side of said rotating cylinder and thereafter discharged on to said last mentioned conveyor. 45 50

20. Apparatus as claimed in any of claims 17 to 19, wherein the two conveyors are movable in opposite directions with respect to one another.

21. A method of forming a uniform rope of tobacco substantially as described herein with reference to the accompanying drawings. 55

22. Apparatus for forming a uniform rope of tobacco substantially as described herein with reference to the accompanying drawings. 60

A. M. & WM. CLARK,
Chartered Patent Agents,
5, Stone Buildings, Lincoln's Inn,
London, W.C.2.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press (Leamington) Ltd.—1964. Published by The Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.

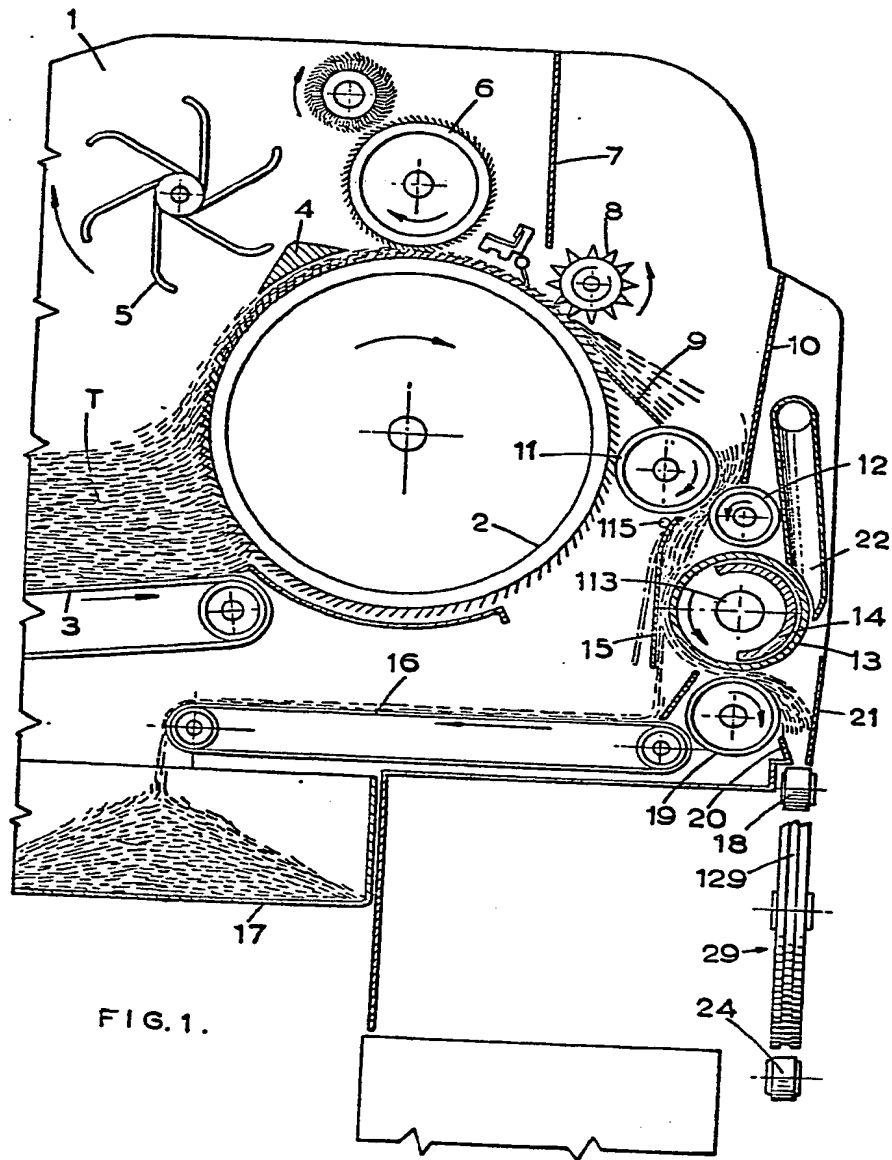
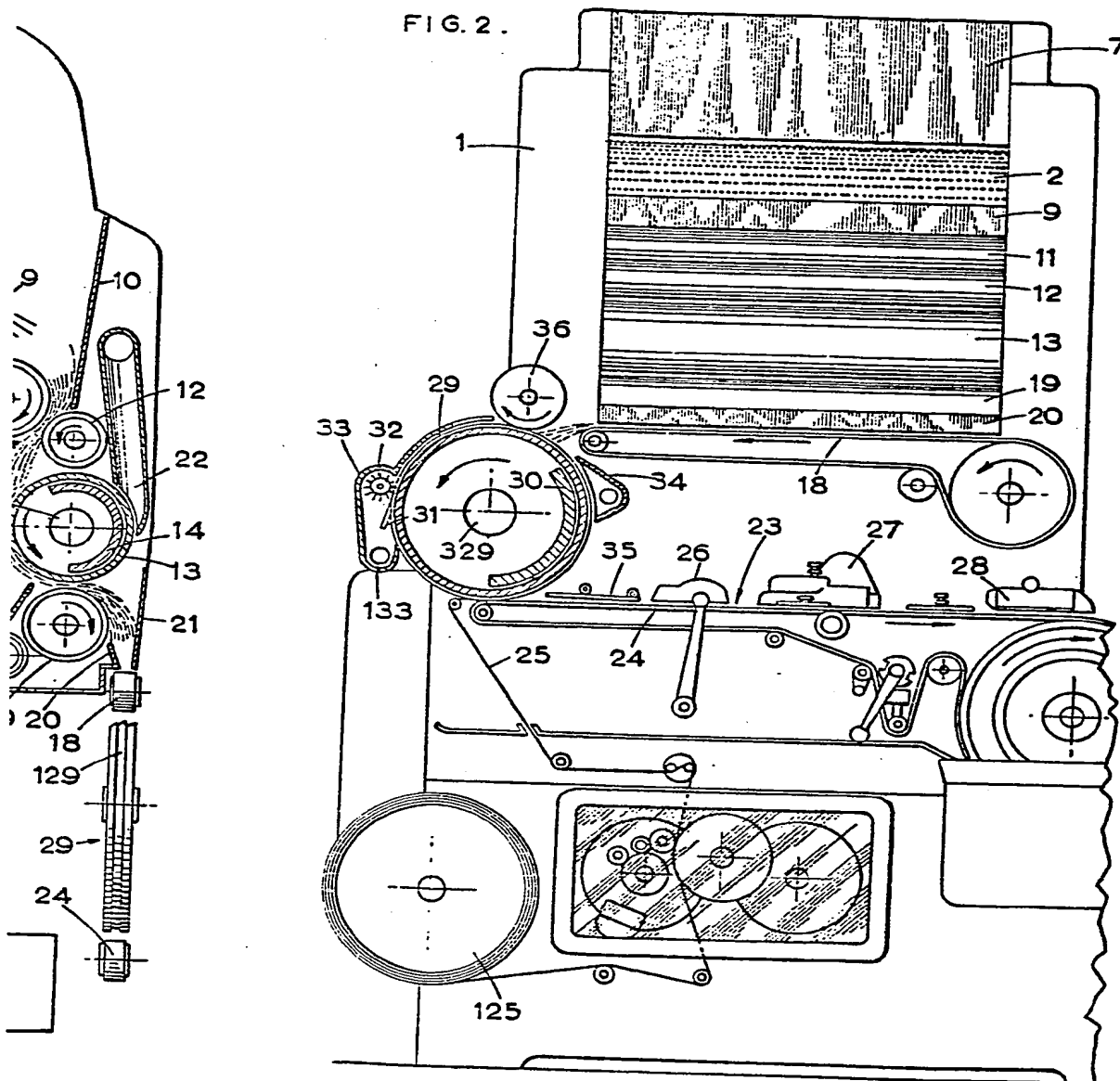


FIG. 2.



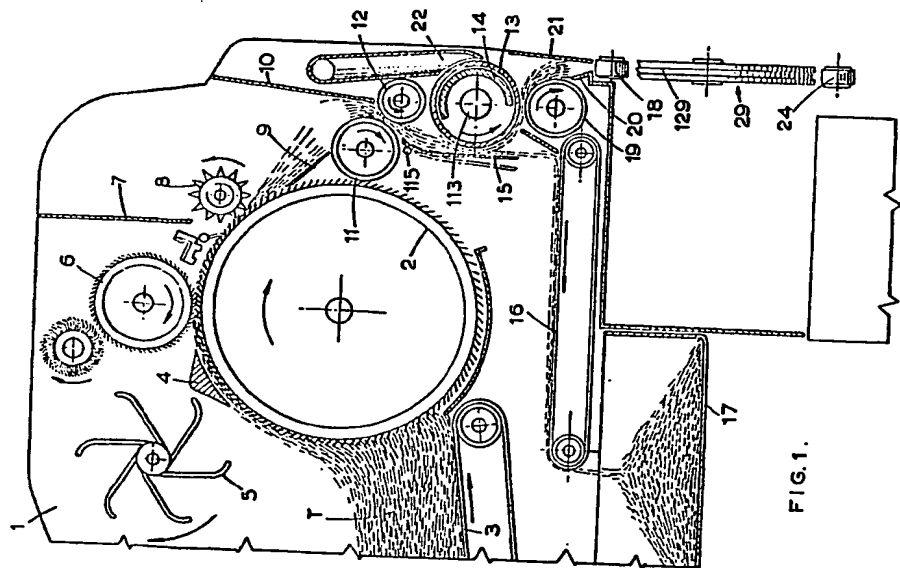


FIG. 1.

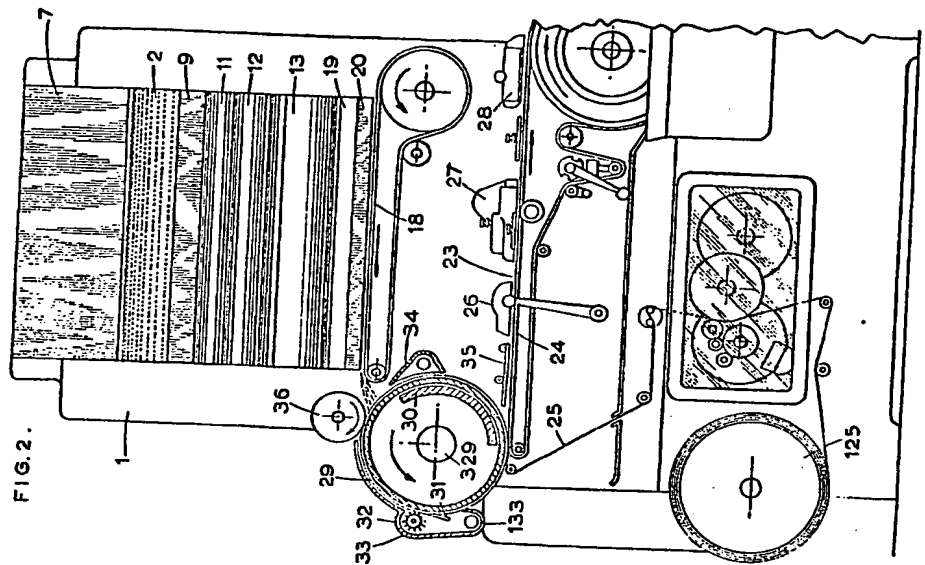


FIG. 2.

FIG. 3.

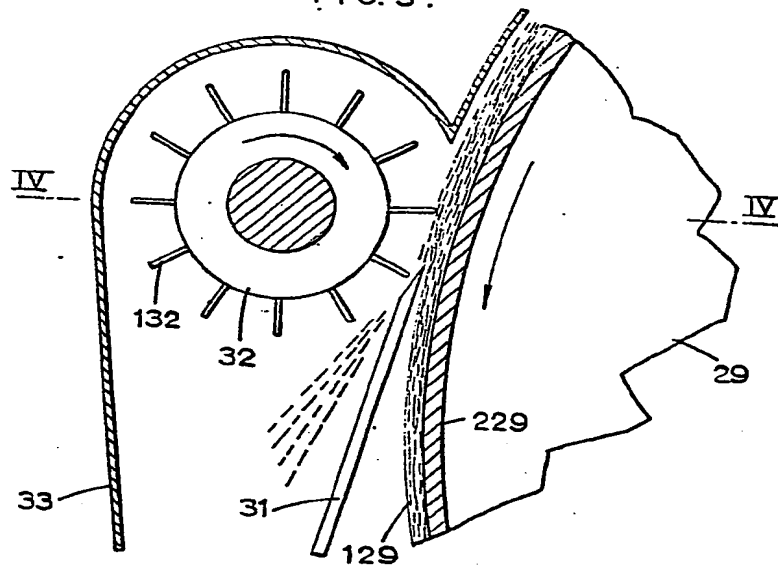


FIG. 5.

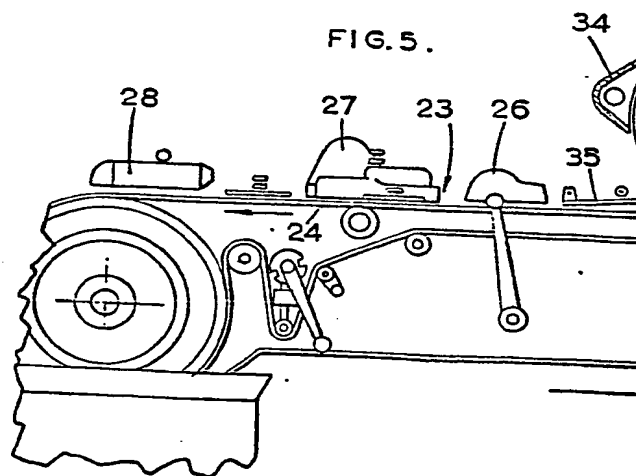


FIG. 4.

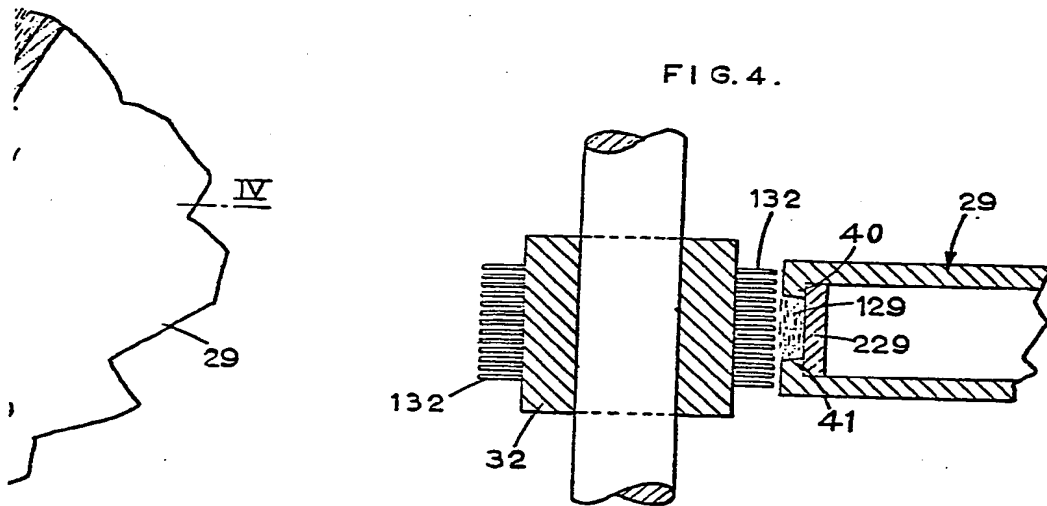
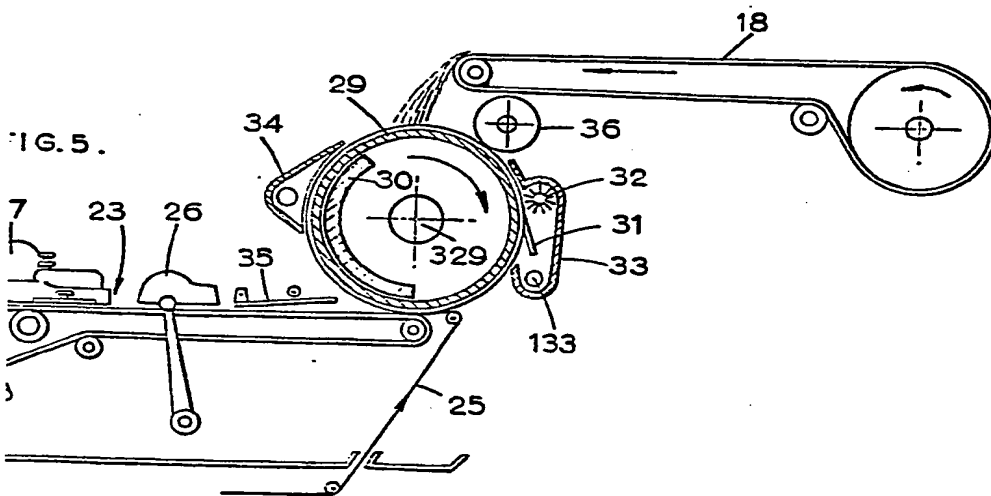
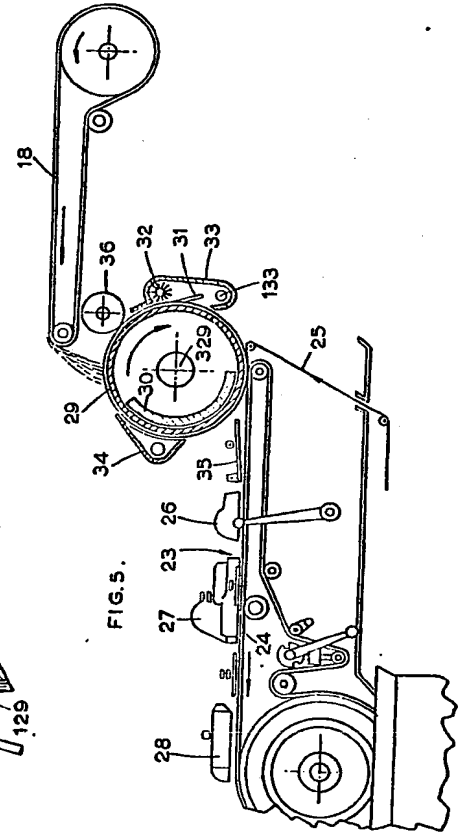
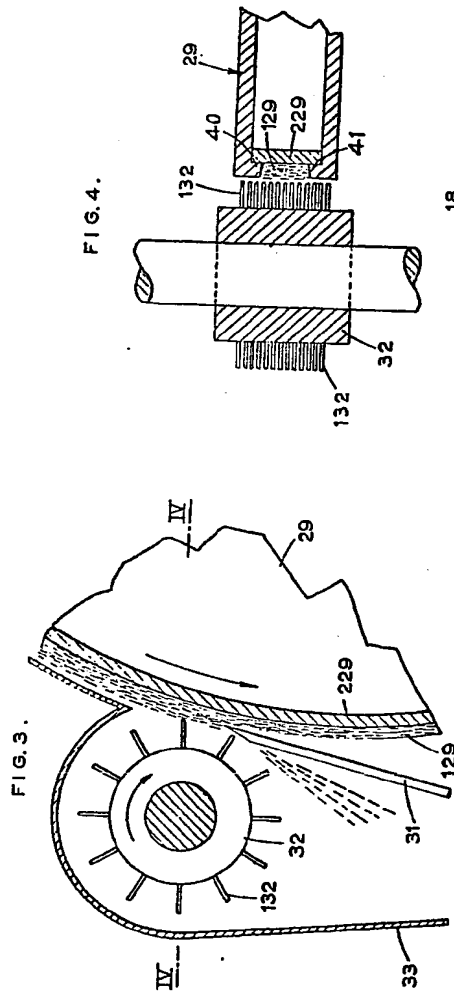


FIG. 5.





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